MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2015/2016

EEE1026 – ELECTRONICS II

(All Sections / Groups)

10th MARCH 2016
9:00 a.m. - 11:00 a.m.
(2 Hours)

INSTRUCTION TO STUDENTS

1. This Question paper consists of **9** pages including cover page with **4** Questions only.

2. Attempt **ALL FOUR** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please print all your answers in the answer Booklet provided.

QUESTION 1

(a) Junction Field Effect Transistor (JFET) is a type of transistor that has become a fundamental building component of many electronic devices.

(i) Distinguish two (2) device characteristics of JFET that differ from Bipolar Junction Transistor (BJT). [4 marks]

(ii) Sketch the typical output and transfer characteristics of an n-channel JFET and indicate clearly all important components of the curves, including I_D, V_{GS} and the V_{DS} axis. [4 marks]

(b) For the JFET circuit shown in **Figure Q1(b)**, using its transfer characteristic shown in Graph Q1 or by means of calculation method, determine the value of R_S required for a 9.5mA drain current, I_D. [4 marks]

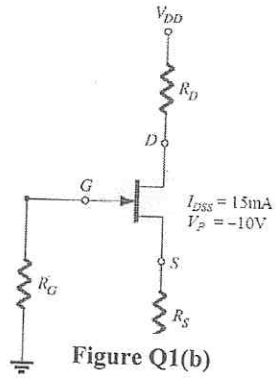
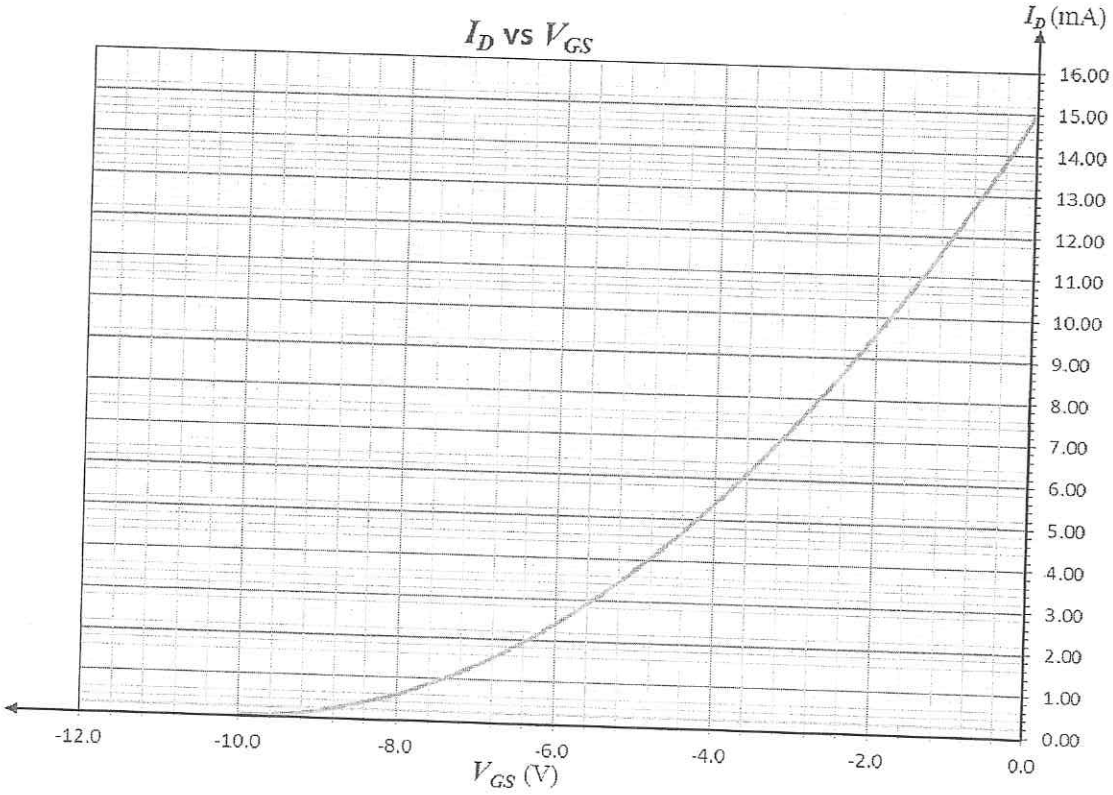


Figure Q1(b)



Graph Q1

Continued...

(c) The basic JFET switch differs from the BJT switch in a number of ways . Sketch the circuit diagram of a basic JFET and BJT switch respectively and with the aid of graphical representations, indicate how a JFET switch differs from its BJT counterpart.

[9 marks]

(d) A square wave of 50% duty cycle, 100 kHz is driving the transistor switch as shown in **Figure Q1(d)**. Determine the value of base resistance (R_B) to improve the switching time. Given speed-up capacitor C_S =1nF.

[4 marks]

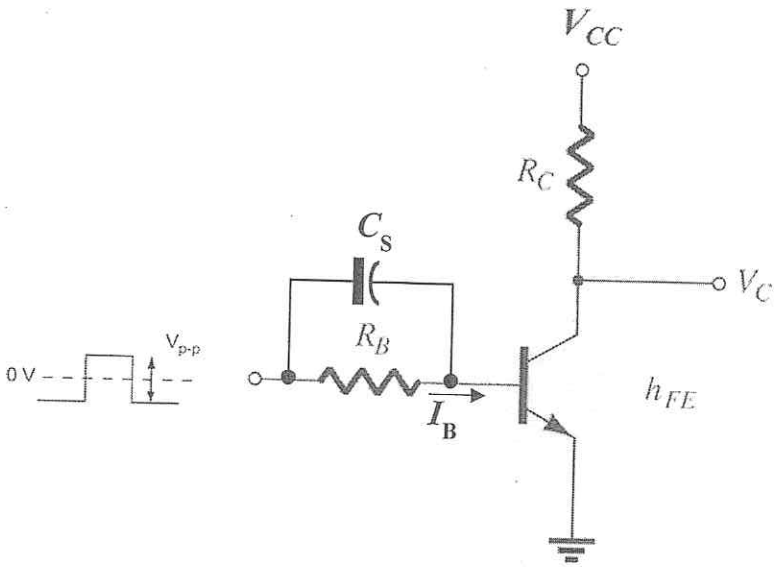


Figure Q1(d)

Continued...

Question 2

(a) The common source Field Effect Transistor (FET) amplifier circuit is shown in **Figure Q2 (a)**. The JFET operates up to 75 kHz and Gate resistance (R_G) =750kΩ, load resistance (RL) =∞ and drain resistance (R_D) = 75kΩ.The FET parameters are trans conductance (gm) = 3mA/V, small signal drain resistance (rd)= 70k , Cgs = 4pF, Cds=Cgd=2pF. Calculate the following

(i) Voltage gain |AV|.

[10 marks]

(ii) Input impedance |Zi|.

[2 marks]

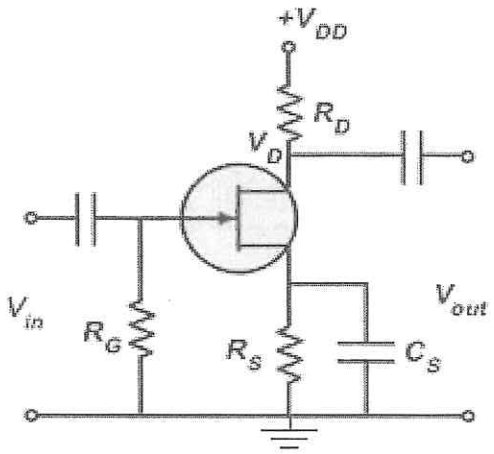


Figure Q2 (a)

Continued...

(b) **Figure Q2(b)** shows an amplifier at low frequency region behaves like a simple high pass filter . Calculate the value of the resister R given that C= 68nF.

[2 marks]

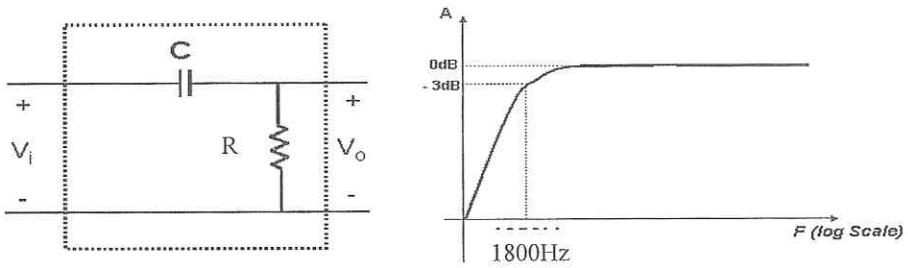


Figure Q2(b)

(c) For the amplifier circuit shown in **Figure Q2(c)**, V_{DD} = 14V, C_i=C_s=C_o=6μF , r_i = 1kΩ, R_1 = 50kΩ, R_2 = 20MΩ, R_D = 6.3kΩ, R_S=1.5kΩ and R_L = 2.2kΩ. Determine the following:

(i) The lower cut-off frequency f_{Lci} due to the coupling capacitor C_i at the input.

[4 marks]

(ii) The lower cut-off frequency f_{Lco} due to the coupling capacitor, C_o connected to the output.

[3 marks]

(iii) The lower cut-off frequency f_{Lcs} due to the by-pass capacitor C_s.

[4 marks]

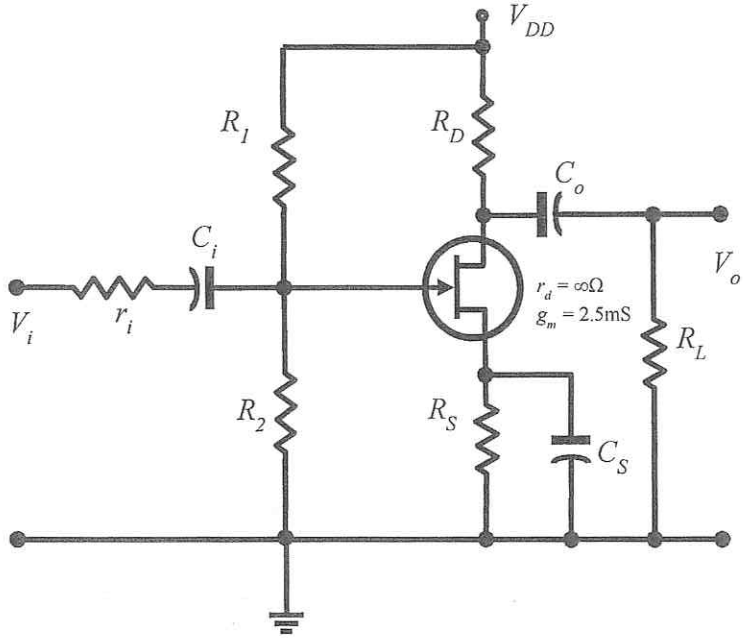


Figure Q2(c)

Continued...

Question 3

(a) Discuss the reason Class B power amplifier has a higher efficiency than a class A power amplifier circuit.

[4 marks]

(b) For the class A power amplifier shown in **Figure Q3(b)** Assume that: V_{BE}=0.7V, determine the following:

(i) $V_{CE(off)}$ and $I_{C(sat)}$.

[8 marks]

(ii) The compliance of the amplifier.

[2marks]

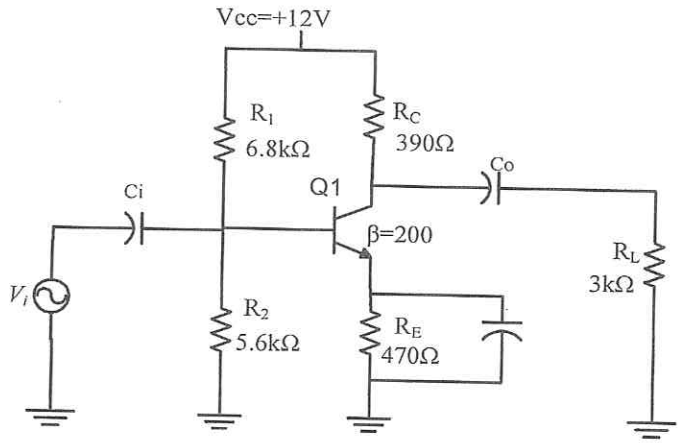


Figure Q3(b)

Continued...

(c) **Figure Q3(c)** shows a Darlington emitter follower. Given $C_1=C_2=1\mu F$ and internal resistance $r_i = 5k\Omega$. Calculate the following:

(i) Input impedance Z_i.

[3marks]

(ii) Current gain A_i.

[3marks]

(iii) Output impedance Z_o.

[2marks]

(iv) Voltage gain A_v.

[3marks]

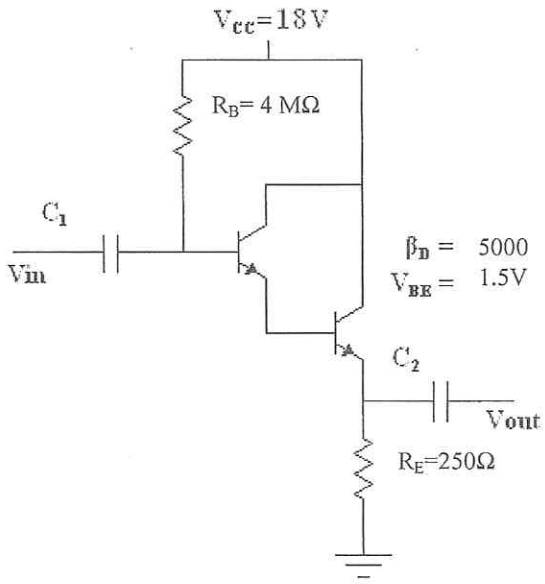


Figure Q3(c)

Continued...

QUESTION 4

(a) A common-source JFET amplifier circuit is shown in **Figure Q4(a)**. Given that the component values of the amplifier circuit and other parameters are as follows:
$R_1 = 910\text{k}\Omega$, $R_2 = 110\text{k}\Omega$, $R_D = 2.2\text{k}\Omega$, $R_S = 1.1\text{k}\Omega$, $R_i = 600\Omega$, $R_L = 1\text{k}\Omega$.
$C_i = C_o = C_S = 2.2\mu\text{F}$.
$V_{DD} = 20\text{V}$, $V_P = -3.5\text{V}$, $I_{DSS} = 10\text{mA}$.

(i) Draw the small-signal model of the amplifier and appropriately label all components.

[3 marks]

(ii) Draw the DC equivalent circuit of the amplifier and appropriately label all components

[2 marks]

(iii) Using graphical method or otherwise, determine the following:

i) V_G

ii) I_{DQ} and V_{GSQ}

[2 marks]

[6 marks]

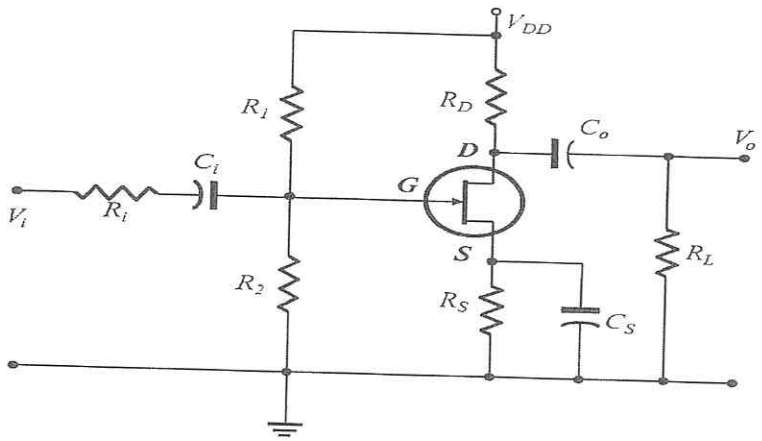


Figure Q4(a)

Continued...

(b) List the names of three solid state multivibrators and illustrated the behaviour of these multivibrators using simple mechanical see-saw equivalent.

[3 marks]

(c) A non-inverting Schmitt trigger circuit is shown in **Figure Q4(c).** Given $R_i = 30k$, $R_f = 120k$ and supply voltages as $\pm$ 14 V. Determine the **Upper Trigger Point**(UTP) and **Lower Trigger Point** (LTP) values for a non-inverting circuit. **Draw** the circuit and its waveforms, assuming the input as a sinusoidal signal Vpp = 30V.

[9 marks]

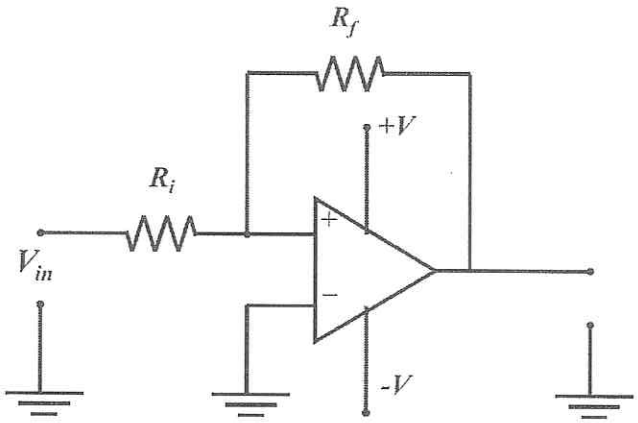


Figure Q4(c)

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